Composition of Zooplankton in Ballast Water of Ships Entering Puget Sound

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Ship's ballast is the primary form of transport of non-indigenous aquatic species. Marine cargo trade into the State of Washington is projected to increase by two-thirds over the next twenty years with most incoming trade originating from Asian ports. The threat of introductions of known invasive species, plus new potential invaders may increase as Puget Sound shipping intensifies. Currently, open-ocean exchange of ballast water is the only method used to decrease or eliminate ballast water introductions. Our study assessed zooplankton in the ballast water of ships entering Puget Sound for the presence of invasive, coastal, and oceanic species. Surveys were conducted aboard container and bulk carriers entering the ports of Seattle and Tacoma. Ships were boarded and triplicate vertical zooplankton tows were taken from one ballast tank. Ballast water reporting forms were collected to confirm last port and location of open ocean exchange. These reports showed that all but a few ships recorded an open ocean ballast exchange. However, analysis of zooplankton samples indicated that about one-sixth of ships sampled contained known non-indigenous species; about two-thirds of ships contained coastal zooplankton, which may indicate that open-ocean exchange was either not conducted or was not completely successful. Our research results suggest that the risk of introducing invasive aquatic species may continue if ballast water exchange continues as the only water management practice in Washington State.